

India's Anti-Satellite Mission "Shakti": A Review of Legacy and Future Prospects

Malaya Kumar Biswal M*

Founder & CEO, Acceleron Aerospace, Bangalore, Karnataka, India – 560037

India's inaugural anti-satellite test, "Mission Shakti," demonstrated the nation's prowess in intercepting intercontinental ballistic missiles while underscoring the imperative of safeguarding space from militarization. This paper provides a comprehensive review of the mission's significance, operational specifics, and challenges encountered. With the successful test conducted on March 27, 2019, attention is drawn to future challenges and implications of ASAT testing, alongside India's evolving international collaborations in space defense. The core objective of India's ASAT initiative remains the assurance of national security against potential ballistic threats from outer space.

1. Mission Overview and Prospects

The advent of anti-satellite weaponry has emerged as a critical component of national defense strategies globally. Following the successful demonstrations by nations like the US, Russia, and China, India marked its entry with "Mission Shakti" on March 27, 2019, launched from Abdul Kalam Island. Utilizing an upgraded version of the Prithvi Defense Vehicle Mark-II, the mission targeted India's defunct "Microsat-R" satellite in Low Earth Orbit (LEO), showcasing India's capability to intercept intercontinental ballistic missiles.

The ASAT weapon employed a three-stage vehicle comprising an interceptor, kinetic kill vehicle, and solid rocket motor, powered by solid propellants. Executed at a lower altitude of 300 km to mitigate space debris threats, the test achieved commendable accuracy, generating approximately 270 debris pieces, which subsequently reduced to around 50 by late 2019. India's Defense Research and Development Organization (DRDO) envisions further enhancements enabling the destruction of all LEO satellites.

Post the ASAT demonstration, India received appreciation from Russian defense agencies and an invitation to collaborate on space weaponization and militarization treaties. In pursuit of bolstering national security, India is actively developing co-orbital ASAT weapons, laser-guided ASATs, and Electromagnetic pulse-based ASAT systems. This endeavor not only fortifies India's defense capabilities but also positions it as a significant contributor to global efforts against space militarization.

2. Timeline of Evolution of India's Anti-Satellite Mission

- 1999: Initiation of Ballistic Missile Defense Systems
- 2007: Successful Demonstration of Prithvi Air Defense Interceptor
- 2009: Development of Prithvi Defense Vehicle
- 2014: Maiden test of Prithvi Defense Vehicle
- 2016: Approval of Project Shakti by the Indian Government
- 2019: Second maiden test of Prithvi Defense Vehicle
- 2019: Successful Demonstration of ASAT "Mission Shakti"

3. Conclusion

India's successful demonstration of the anti-satellite capability through "Mission Shakti" marks a significant milestone in the nation's defense endeavors and space exploration narrative. Beyond showcasing technological prowess, the mission underscores India's commitment to safeguarding its national security interests amidst evolving geopolitical dynamics and emerging threats in outer space. The test not only highlights India's indigenous technological advancements but also signals its proactive stance in addressing challenges posed by

*Founder & CEO, Acceleron Aerospace, Bangalore, Karnataka, India – 560037. Contact: malaykumar1997@gmail.com

**Received: 25-April-2024 || Revised: 28-April-2024 || Accepted: 30-April-2024 || Published Online: 30-April-2024

potential adversaries. As India navigates its trajectory in space exploration and defense, collaboration with global partners and adherence to international norms remain paramount.

Looking ahead, India's pursuit of advanced ASAT capabilities and its engagement in international treaties aimed at curbing space weaponization underscore a concerted effort towards fostering peace and stability in the cosmos. "Mission Shakti" is not merely a demonstration of power but a testament to India's resolve to secure its interests while contributing to global efforts aimed at preserving the sanctity of space for future generations.



Figure-1 India's ASAT Before and During Launch [Image Courtesy: DRDO, India]

4. References

- [1] Bedi, R. India's DRDO reveals additional details of recent ASAT missile test.
- [2] Kosambe, S. (2019). Mission Shakti aka Project XSV-1: India's First Anti-Satellite Test (ASAT).
- [3] Akhmetov, V., Savanevych, V., & Dikov, E. (2019). Analysis of the Indian ASAT test on March 27, 2019. arXiv preprint arXiv:1905.09659.
- [4] Gupta, S. (2020). India Plans 5,000-km Range Submarine-launched Ballistic Missile. Hindustan Times, 26.

8. Conflict of Interest

The authors declare that there are no conflicts of interest regarding the publication of this article.

9. Funding

No external funding was received to support or conduct this study.